REMARKS

This Amendment is in response to the Office Action of October 4, 2005 in which claims 1-21 were rejected were rejected under 35 U.S.C. § 102(e) as being anticipated by Reinert (U.S. Pat. No. 6,539,489). With this Amendment, claims 1, 6, 12, 18, and 21 are amended. Amended claim 1 recites a method for time synchronization of field devices on a network of a distributed control system comprising "adjusting a long-term clock signal frequency and a time stamp of each field device ..." The present invention synchronizes slave device clocks by using timing information to adjust the frequency of the output clock of each slave device. The purpose is to synchronize the clock rates or frequencies of the time slave device 18 with the clock rate of the time master 16 on the network segment. Adjusting the output clock frequency changes the long-term rate of the clock (page 10, lines 3-22).

In contrast, Reinert et al. disclose a method for synchronizing a slave system with a master system by phase compensating or time shifting the output clock (col. 6, line 53 to col. 7, line 23). In other words, Reinert et al. is directed to synchronizing the slave event start pulse time with the master event start pulse time (col. 7, lines 10-23). The phase of the slave clock is shifted such that the start pulse of the clock occurs within a specific interval (col. 6, lines 42-52). The phase shift is accomplished by using adjustment variables that indicate the amount of shifting needed for a signal to fall within an acceptable interval (col. 6, lines 53-64). Reinert et al. do not mention anything about adjusting the frequency or rate of the clock. When phase shifting or time shifting a signal, the long-term frequency remains the same. Thus, the recited elements of claim 1 are not disclosed by Reinert et al. and the rejection of claim 1 under 35 U.S.C. § 102(e) should be withdrawn. Because claims 2-5 depend from allowable claim 1, they are allowable therewith.

Amended claim 6 recites a method of synchronizing a local sense of time of each of a plurality devices to a clock of a master field device comprising "calculating a frequency ratio comprising a sense of time of the master field device divided by the local sense of time of a field device." Amended claim 12 recites a process control system having a common sense of time comprising "a plurality of time

slave devices in communication with the control network, each time slave device having a local clock, and a time adjustment element for adjusting the local clock according to a frequency ratio comprising the master clock signal divided by an output clock signal of the local clock." The frequency ratio indicates whether the rate of the time slave 18 signal is within an acceptable range of the rate of the time master 16 clock signal (page 12, line 20 to page 13).

In Reinert et al., each slave system 202 is synchronized with the master system 201 by first generating an expectancy time interval or window T_{int} 44, which represents the maximum phase or timing error that may be acceptable. Col. 7, line 66 - col. 8, line 5. The time interval or window T_{int} 44 is defined by the minimum time T by the minimum time T_{min} 41, the actual time T_{act} 42 and the maximum time T_{max} 43, and corresponds to the clock "jitter" (i.e., the difference between the minimum time T_{min} 41 and the maximum time T_{max} 43) among master system 201 and slave systems 202. Col. 8, lines 5-14. The slave event start pulse 50a is then phase compensated or time shifted so that it may occur within the expectancy time interval or window T_{int} 44. However, there is no mention of dividing signals or senses of time between the master system 201 or the slave systems 202 in this process. Thus, there is no teaching or suggestion of calculating a frequency ratio by dividing the sense of time of the master field device by the local sense of time of a field device, as required by claim 6. Nor is there any teaching or suggestion of each time slave device adjusting the local clock according to a frequency ratio comprising the master clock signal divided by an output clock signal of the local clock, as required by claim 12. Therefore, the recited elements of claims 6 and 12 are not disclosed by Reinert et al. and the rejection of claims 6 and 12 under 35 U.S.C. § 102(e) should be withdrawn. Because claims 7-11 depend from allowable claim 6, and claims 13-17 depend from allowable claim 12, they are allowable with their base claim.

Claim 18 as originally submitted recites a method for reducing time processing cycles in distributed field devices of a process control network comprising "calculating adjustment coefficients for each field device according to a difference in frequencies between a local clock of each field device and a master clock of a time master device on the process control network." Upon receipt of a TD DLPDU,

the timer adjust element 32 reads the time stamp values from the End of Message (EOM) time stamp register 30. The timer adjustment element 32 calculates the adjustment coefficients. The coefficients are used to adjust the frequency or rate of the local clock in the time slave (page 9, line 27 to page 10, line 13).

As described above, in Reinert et al. each slave system 202 is synchronized with the master system 201 by first generating an expectancy time interval or window T_{int} 44, which represents the maximum phase or timing error that may be acceptable. Col. 7, line 66 - col. 8, line 5. The time interval or window T_{int} 44 is defined by the minimum time T by the minimum time T_{min} 41, the actual time T_{act} 42 and the maximum time T_{max} 43, and corresponds to the clock "jitter" (i.e., the difference between the minimum time T_{min} 41 and the maximum time T_{max} 43) among master system 201 and slave systems 202. Col. 8, lines 5-14. The slave event start pulse 50a is then phase compensated or time shifted so that it may occur within the expectancy time interval or window T_{int} 44. However, there is no mention at all of the frequencies of either the master system 201 or the slave systems 202 being used in this process. Thus, Reinert et al. does not teach or fairly suggest calculating adjustment coefficients for each field device according to a difference in frequencies between a local clock of each field device and a master clock of a time master device on the process control network, as recited by claim 18. Therefore, the recited elements of claims 18 are not disclosed by Reinert et al. and the rejection of claims 18 under 35 U.S.C. § 102(e) should be withdrawn. Because claims 19-21 depend from allowable claim 18, they are allowable therewith.

CONCLUSION

In view of the foregoing, all pending claims 1-21 are in condition for allowance. Reconsideration and allowance of all pending claims are respectfully requested.

Respectfully submitted,

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